



Installation Manual

ARCnet

Installation Manual

First Edition/(April 1989)

IBM PC/XT/AT, PS/2, PC-DOS, MS-DOS, Novell NetWare, SMC, ARCNET are registered trademarks.

Second Edition, July 1989, 2000

Contents

Chapter 1. Introduction	1-1
Overview	1-1
Features	1-2
Specifications	1-3
 Chapter 2. Configuring the ARCnet Card	 2-1
Node ID: SW1	2-2
Base I/O Address: SW2-1 through SW2-3	2-3
Memory Address: SW2-4 through SW2-8	2-3
Interrupt Request Line (IRQ).....	2-5
Timeout Parameters	2-6
Remote Boot	2-6
 Chapter 3. Installing the Network	 3-1
Star Topology Network	3-2
Bus Topology Network	3-6
Combined Star and Bus Topology Network	3-9

Chapter 1. Introduction

Overview

The **ARCnet** is a high performance local area network (LAN) for IBM PC/XT/AT/386 and compatibles, uses the Modified Token-Passing protocol, and can be configured as a **star**-topology, **bus**-topology, or **combined star and bus** topology network, allowing up to 255 users to communicate with each other and share peripheral devices such as disks, printers, ..., etc.

The ARCnet card features a high data transmission rate of 2.5 mega bits per second and employs the Surface Mount Technology for higher reliability. The ARCnet card is a **mini-sized** card that fits into an expansion slot in an IBM PC/XT/AT/386 or compatible. It is fully compatible with SMC's ARCNET network controller boards and **Novell's NetWare** and **ELS** network operating systems.

Features

- New mini-sized
- Brand new SMC COM90C65 LAN controller and transceiver
- High performance 2.5 Mbps data transmission rate
- Up to 255 nodes
- Fully compatible with Standard Microsystems Corporation's ARCNET network controller boards
- Fully compatible with Novell's NetWare and ELS network operating systems
- Surface Mount Technology for higher reliability
- On-board 2K data packet buffer holds up to 4 packets providing double-buffered transmit and receive functions
- On-board driver hybrid provides greater reliability
- On-board 8K (remote boot) PROM socket
- Interrupt Request (IRQ) line is set by jumper
- Base I/O address is switch selectable
- Base memory addresses for data packet buffer and remote boot PROM are switch selectable

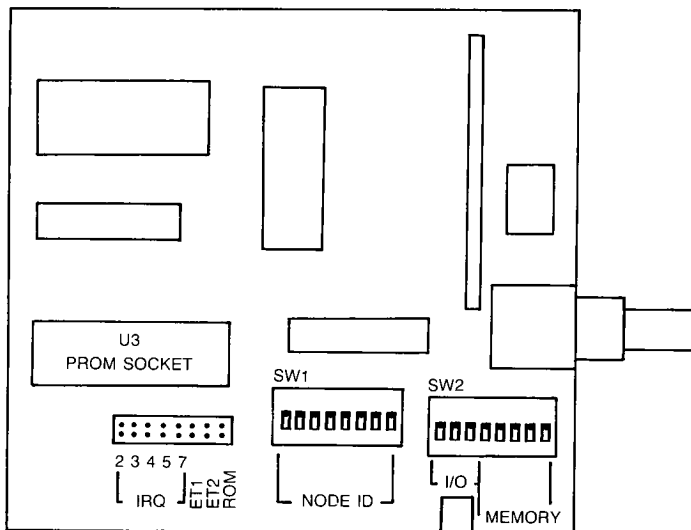
Specifications

- **Controller & Transceiver** SMC COM90C65 LAN Controller and Transceiver
- **Network Interface** Compatible with Datapoint's ARCNET Specifications
- **Data Rate** 2.5 Mega Bits/Sec.
- **Protocol** Modified Token Passing
- **Topology** Star, Bus or Combined
- **Cable** RG-62 A/U Coaxial Cable
- **Computer** IBM PC/XT/AT/386 and Compatibles
- **Network O.S.** Novell NetWare and ELS
- **Users** 255 Maximum
- **Memory** 2K × 8 Static RAM for Data Packet Buffer, Socket for 8K × 8 EPROM
- **Power** + 5 Volts at 850 mA Maximum
- 5 Volts at 8 mA Maximum
- **Environmental** Operates at 0 to 70 Degrees Centigrade

Chapter 2. Configuring the ARCnet Card

The ARCnet offers two types of boards which support two different kinds of driver hybrid respectively: low-impedance driver (SMC 9068) for star topology and high-impedance driver (SMC 9058) for bus topology. The two various ARCnet cards remain the same way to configure.

The ARCnet card contains two 8-position switches and eight jumper positions as shown below. These switches and jumper positions are mainly used for the node ID, base I/O address, memory address, interrupts and the timeout parameters.



Board Layout

Node ID: SW1

The 8-position DIP switch **SW1** is used to set the node ID number. Note that unique node ID number is required for each station to avoid confusion in station identification.

The **SW1-1** is defined as the most significant bit (MSB) and **SW1-8** as least significant bit (LSB). A **switch off** equals '1'. A total of 255 switch settings can be chosen to set the node ID number.

SW1	1	2	3	4	5	6	7	8
Node ID	MSB							LSB

Note: You must not use 0 (zero) as the node ID number for any station since it is reserved by system as broadcast address.

Default: 255 (Off Off Off Off Off Off Off Off)

Base I/O Address: SW2-1 through SW2-3

SW2-1	SW2-2	SW2-3	Base I/O Address
On	On	On	260H-26FH
On	On	Off	290H-29FH
On	Off	On	2E0H-2EFH
On	Off	Off	2F0H-2FFH
Off	On	On	300H-30FH
Off	On	Off	350H-35FH
Off	Off	On	380H-38FH
Off	Off	Off	3E0H-3EFH

Default: On Off On (2E0H-2EFH)

Note: The address 2F0H-2FFH may not be used as base I/O address if the BIOS (for example, Award 3.03GS) sets this address as serial port location.

Memory Address: SW2-4 through SW2-8

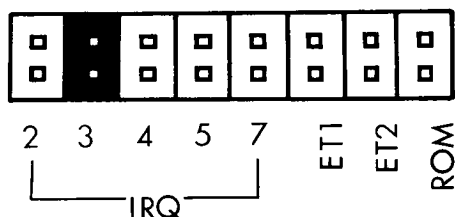
The five positions (SW2-4 through SW2-8) of DIP switch **SW2** are used to select the base addresses of 2K data packet buffer (RAM) and 8K remote boot PROM.

Default: On Off Off On On (D0000H-D07FFH)

SW2-4	SW2-5	SW2-6	SW2-7	SW2-8	RAM Address	PROM Address
On	On	On	On	On	C000H-C07FFH	C2000H-C3FFFFH
On	On	On	On	Off	C0800H-C0FFFFH	C2000H-C3FFFFH
On	On	On	Off	On	C1000H-C17FFH	C2000H-C3FFFFH
On	On	On	Off	Off	C1800H-C1FFFFH	C2000H-C3FFFFH
On	On	Off	On	On	C4000H-C47FFH	C6000H-C7FFFFH
On	On	Off	On	Off	C4800H-C4FFFFH	C6000H-C7FFFFH
On	On	Off	Off	On	C5000H-C57FFH	C6000H-C7FFFFH
On	On	Off	Off	Off	C5800H-C5FFFFH	C6000H-C7FFFFH
On	Off	On	On	On	CC000H-CC7FFH	CE000H-CFFFFH
On	Off	On	On	Off	CC800H-CCFFFFH	CE000H-CFFFFH
On	Off	On	Off	On	CD000H-CD7FFH	CE000H-CFFFFH
On	Off	On	Off	Off	CD800H-CDFFFFH	CE000H-CFFFFH
On	Off	Off	On	On	D0000H-D07FFH	D2000H-D3FFFFH
On	Off	Off	On	Off	D0800H-D0FFFFH	D2000H-D3FFFFH
On	Off	Off	Off	On	D1000H-D17FFH	D2000H-D3FFFFH
On	Off	Off	Off	Off	D1800H-D1FFFFH	D2000H-D3FFFFH
Off	On	On	On	On	D4000H-D47FFH	D6000H-D7FFFFH
Off	On	On	On	Off	D4800H-D4FFFFH	D6000H-D7FFFFH
Off	On	On	Off	On	D5000H-D57FFH	D6000H-D7FFFFH
Off	On	On	Off	Off	D5800H-D5FFFFH	D6000H-D7FFFFH
Off	On	Off	On	On	D8000H-D87FFH	DA000H-DBFFFFH
Off	On	Off	On	Off	D8800H-D8FFFFH	DA000H-DBFFFFH
Off	On	Off	Off	On	D9000H-D97FFH	DA000H-DBFFFFH
Off	On	Off	Off	Off	D9800H-D9FFFFH	DA000H-DBFFFFH
Off	Off	On	On	On	DC000H-DC7FFH	DE000H-DFFFFH
Off	Off	On	On	Off	DC800H-DCFFFFH	DE000H-DFFFFH
Off	Off	On	Off	On	DD000H-DD7FFH	DE000H-DFFFFH
Off	Off	On	Off	Off	DD800H-DDFFFFH	DE000H-DFFFFH
Off	Off	Off	On	On	E0000H-E07FFH	E2000H-E3FFFFH
Off	Off	Off	On	Off	E0800H-E0FFFFH	E2000H-E3FFFFH
Off	Off	Off	Off	On	E1000H-E17FFH	E2000H-E3FFFFH
Off	Off	Off	Off	Off	E1800H-E1FFFFH	E2000H-E3FFFFH

Interrupt Request Lines (IRQ)

The first five jumper positions (labelled 2 3 4 5 7) on the card are used to select IRQ 2, 3, 4, 5, and 7 respectively as shown below. An IRQ line is required when the ARCnet card needs a service from the PC host. Note that the IRQ line must be different from that of any other add-on card installed in your PC.



Default: IRQ 3

Timeout Parameters

The two jumper positions (labelled **ET1** and **ET2**) on the card are used to set up the node timeout values (response and reconfiguration time). Every node in a network must be set to the same timeout values. An '**On**' in the following figure indicates that a mini-plug should be placed on the jumper position.

ET1	ET2	Response Time (μ s)	Reconfiguration Time (ms)
Off	Off	78	840
Off	On	285	1680
On	Off	563	1680
On	On	1138	1680

Default: Off Off (Response time: 78 and
Reconfiguration time: 840)

Remote Boot

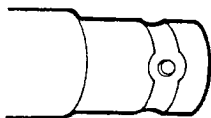
The jumper position labelled **ROM** on the card is used to enable/disable the remote boot feature. The remote boot function will be enabled if there is a mini-plug placed on this jumper position.

Default: Off (Disable)

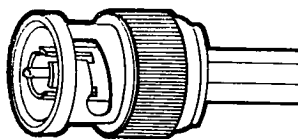
Chapter 3. Installing the Network

ARCnet is an extremely easy-to-install LAN since it offers a flexible topology with few limitation. It can be configured as a simple Star or Bus topology network, or a Combined Star and Bus topology network.

The ARCnet card is equipped with a standard BNC female connector (see figure below) for connection to RG-62 A/U coaxial cable.



BNC Female Connector



BNC Male Connector

Star Topology Network

To install a **star** network, here are the hardware requirements.

ARCnet Card: The ARCnet network card must have **low-impedance** driver hybrid (SMC 9068).

Cable: The ARCnet network uses the RG-62 A/U 93-ohm coaxial cable with BNC male connectors at both ends. It is used to connect a network station, Passive Hub or Active Hub.

Passive Hub: The Passive Hub has four ports with four BNC female connectors to connect a network station or Active Hub. It is used to reply network signals. Any **unused** port on the Passive Hub must be terminated with a 93-ohm BNC Terminator.

Active Hub: The Active Hub consists of eight ports with eight BNC female connectors to connect a network station, Passive Hub or Active Hub. It is used to relay network signals and amplify network signal strength. It is recommended that any unused port on the Active Hub be terminated with a 93-ohm BNC Terminator, however, it is not required.

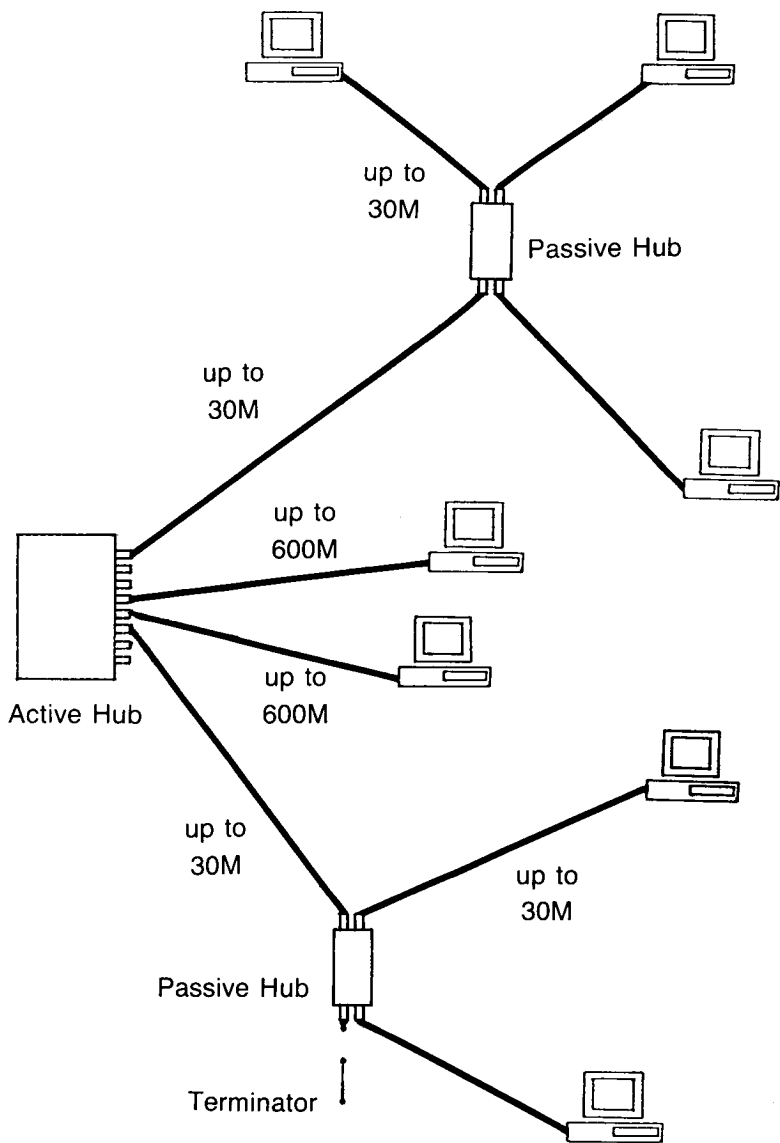
BNC Terminator: The BNC Terminator is equipped with a 93-ohm resistor and is usually installed on the Passive or Active Hub. It is used to prevent the network transmissions from being interfered by reflections.

Installation Rules

While the ARCnet has been designed for maximum flexibility and ease of installation, the installation rules for a **star** topology network layout using low-impedance network cards must be borne in mind and are detailed below:

1. A Passive Hub is mainly used as intermediate connections between stations and Active Hubs. To connect Passive Hubs in series is not allowed since the Passive Hubs only relay network signals but cannot strengthen the signals, otherwise the signal will be too weak to transmit data.
2. Any unused port on the Passive Hub must be terminated with a 93-ohm BNC Terminator.
3. Maximum distance between a Passive Hub and a station: **30** meters (100 feet)
4. Maximum distance between a Passive Hub and an Active Hub: **30** meters (100 feet)
5. An Active Hub can be connected to stations, Passive Hubs, and another Active Hubs.

6. Maximum distance between an Active Hub and a station: **600** meters (2,000 feet)
7. Maximum distance between Active Hubs: **600** meters (2,000 feet)
8. It is recommended that any unused port on the Active Hub be terminated with a 93-ohm BNC Terminator, but it is not required.
9. Maximum distance from one end of the network to the other end: **6,000** meters (20,000 feet)
10. Do not create a **loop**, i.e., a cable coming from a hub travels through other hubs and connects back to the original hub.



Star Topology Network Layout

Bus Topology Network

The bus ARCnet network uses a common bus line called **Trunk Cable** to link stations together. The Trunk Cable can consist of one or many Segments. A **Segment** is defined as a cable length consisting of a number of Sections, and terminated at each end by a BNC Terminator. Every two segments are linked together via an **Active Link**. A **Section** refers to the cable length between two Tee-connectors (stations).

To install a **bus** network, here are the hardware requirements.

ARCnet Card: The ARCnet network card must have **high-impedance** driver hybrid (SMC 9058).

Tee-Connector: The Tee-Connector contains one BNC male connector (to connect to ARCnet card), and two BNC female connectors (to connect to a cable or BNC Terminator).

Cable: The ARCnet network uses the RG-62 A/U 93-ohm coaxial cable with BNC male connectors at both ends. It is used to connect two network stations or an Active Link.

BNC Terminator: The BNC Terminator is equipped with a 93-ohm resistor and is usually installed on the active hub or at the end of a bus network segment. It is used to prevent the network transmissions from being interfered by reflections.

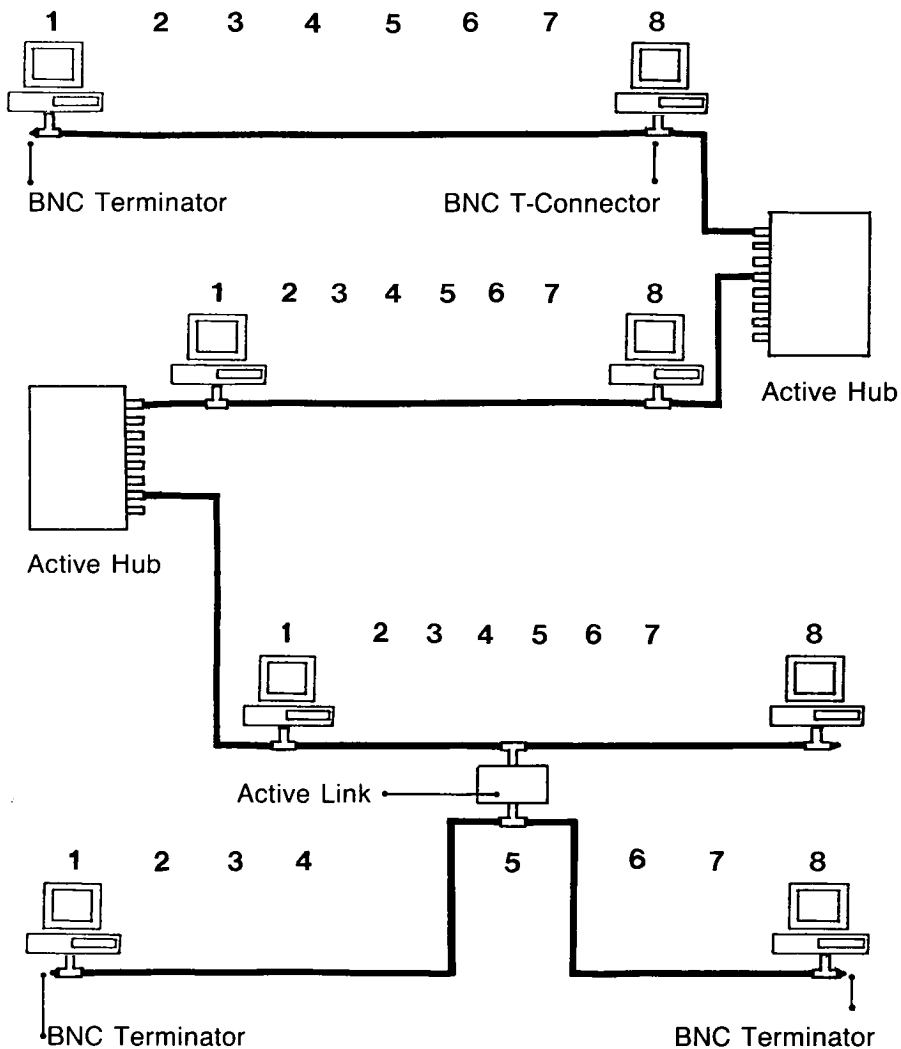
Active Link: The Active Link has two ports with two BNC female connectors to connect two bus network segments.

Installation Rules

While the ARCnet has been designed for maximum flexibility and ease of installation, the installation rules for a **bus** topology network layout using high-impedance network cards must be borne in mind and are detailed below:

1. Connect a station to a cable via a **Tee-connector**.
2. Do not use any cable between a station and a Tee-connector.
3. It is not allowed to use the Passive Hubs on a bus topology network.
4. Minimum distance (section) between two Tee-connectors: 1 meter (3 feet)

5. Maximum number of stations in a bus network segment: **8**
6. Maximum distance of a bus network segment: **300** meters (1,000 feet)
7. Both ends of a bus network segment must be installed with a 93-ohm BNC Terminator or an Active Hub.
8. Maximum distance from one end of the network to the other end: **6,000** meters (20,000 feet)
9. Do not create a **loop**, i.e., a cable coming from a hub travels through other hubs and connects back to the original hub.



Bus Topology Network Layout

Combined Star and Bus Topology Network

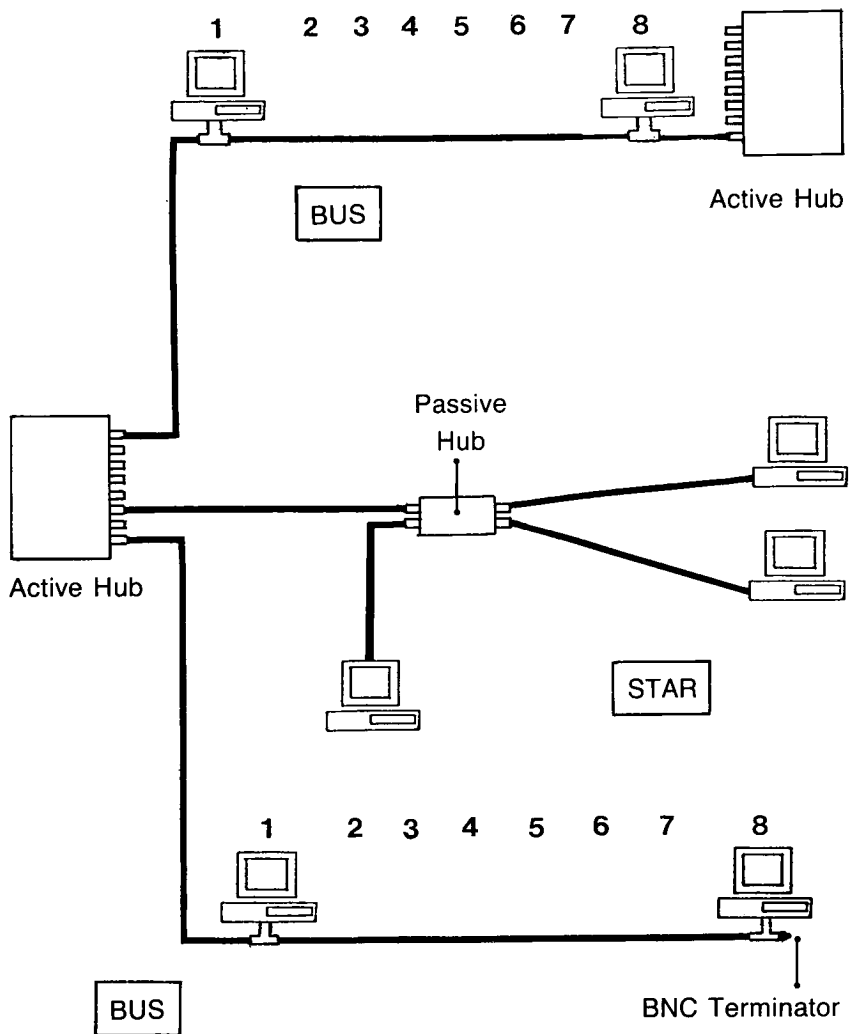
The Combined Star and Bus Topology Network refers to the network layout using the low-impedance and high-impedance ARCnet network cards on the same network.

To install a combined star and bus topology network, you should have the combinations of hardware requirements for star and bus networks as described previously.

Installation Rules

In addition to the installation rules for star and bus networks listed in earlier sections, the installation rules for a **combined star and bus** topology network layout must be observed.

1. A bus network and a star network can be combined on the same network by using an **Active Hub**.
2. A bus network card (high-impedance) may be connected to a hub in place of a low-impedance ARCnet network card in a star network.
3. The low-impedance ARCnet network cards are not allowed to place in the middle of a series of high-impedance ARCnet network cards.



Combined Star and Bus Topology Network Layout

